

# The NEWSLETTER

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Mercury Amateur Radio Association - MARA  
North America - North East

## Spring has arrived!

### Can antenna season be far behind?



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# Grandma Mara's RAMBLINGS...

**A**fter a while, winter gets to you! Even though this past one wasn't the worse one Grandma has ever seen (and it actually was one of the better ones), the lack of decent sunlight and warm breezes makes you kind of cranky. Yes, even though you recognize what the problem is, and you try to allow for it, you still have a real hankering for a warm beach somewhere in the southern Pacific.

Preferably some place with an uncommon call sign prefix!

Walter's idea of a spring time DXpedition is one where you have to time the rise and fall of the waves just right so as to jump from the heaving rubber zodiac to the slimy rocks, where you sleep in a tent and shake the bugs and other creepy crawlies out of your shoes in the morning, and where you operate around the clock for days at a time, never taking a bath (unless it rains!).

Grandma's take on these kinds of jaunts has changed over the years. Long ago, it would have been a lot like Walter's, but now I'm more into the "Comfort Inn" style of things. Let the bugs find a place of their own to sleep. Instead of cold beans straight out of a can, I much prefer *Denny's*, the *Golden Corral*, or *Cracker Barrel* for my away-from-home culinary requirements.

So when the ARRL announced *NPOTA (National Parks On The Air)*, we started to think we might participate as "activators"; those who travel to, and activate a location. Once the weather warms up a little, we would take the RV as our living quarters and operating station. Not a warm beach in the south Pacific with gentle breezes; certainly no rare prefixes, but at least it will be more comfortable than a tent with bugs. And *Denny's*, the 'Corral, or the 'Barrel is more likely to be somewhere nearby!

**“Grandma's take on these kinds of jaunts has changed over the years ... now I'm more into the "Comfort Inn" style of things.**



AR

# TECH AND OTHER STUFF

**T**he MFJ 840 two meter wattmeter arrived in the mail from the supplier (*Durham Radio*) a few days after the order was placed. The inspection sticker on the back of the case was dated 2013, so my guess is that there isn't a big market for these.

Removing the two self-tapping screws that hold the case halves together gives access to the simple printed circuit board (pcb). I looked to see if I could make it work with the new

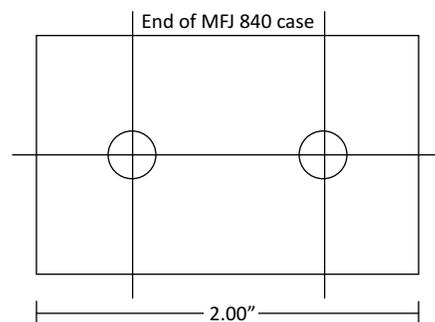


circuit and decided to do that, rather than the extra work of making a new printed circuit board.

Using a de-soldering tool and braid, quickly and carefully unsolder the two meter terminals on the pc board. Next unsolder and lift the BNC connector ground tab. Then, unsolder the wire going to the pcb from the center pin of the BNC. At this point, you should be able to lift and remove the board. Make sure the meter terminals are completely unsoldered and cool before removing the pcb. If not, you may pull one or both of them out of the meter. Remove the old 1N34 diode, the adjustable trimmer capacitor, and the two 100 ohm dummy load resistors. Use the braid to clean up the remaining solder from the pads of the parts removed. Take care not to

use too much heat as you may lift the copper track from the board. I used the old WELER 100/140 watt gun, that I've had for some fifty years, on the low setting. Just make sure you keep the heat source and braid moving to spread the heat. Someone must have been paid a bonus for the amount of solder they used when they assembled mine.

The meter is solidly held to the case with some type of



**Suggested drilling template for Switch SW1 and Connector J2**

glue so I didn't attempt to remove it. I did notice three pieces of clear tape that appears to be holding the movement to the front face. You may be able to lift the tape and take out the meter that way (leaving the front part in the case).

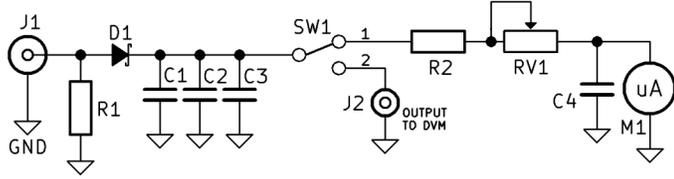


Diagram of the modified MFJ 840 drawn using yet another schematic drawing program - **KICAD**.

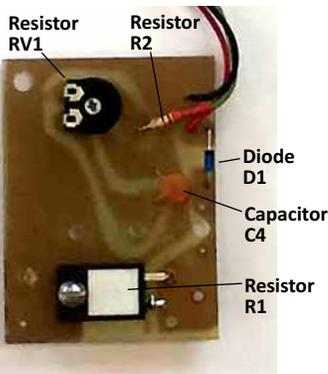
If you opt to leave the meter in place as I did, solder a temporary short across the meter terminals, before you drill the holes for the switch SW1 and connector J2. This will cause the meter movement to be mechanically dampened and provide added protection. Drill the two holes to fit the parts you will be using. I started with a 1/16" bit and worked up in size. Once I had them large enough I switched to a hand held reamer to make the final sized holes. I was worried that the larger bits might catch in the aluminum case.

Remove the shorting wire after you have finished all mechanical work.

Capacitors C1 and C2 are chip type while C3 has wire leads. Use whatever type you have on hand. If the parts you use have wire leads, keep the leads as short as possible. Lift one end of resistor R2 (see picture below) and attach a small insulated, stranded wire to connect to the switch SW1. Use a piece of shrink tubing to cover the solder joint. A dab of glue will hold R2 securely. Leave RV1 and capacitor C4 in place.

Install the 1N5711 diode and the Caddock 50 ohm resistor. Use the photo below for suggested placement for the latter.

The 1N5711 diode peak reverse breakdown voltage of 70 v peak-peak limits the maximum amount of RF power to 12.25 watts. Exceeding this amount will very likely destroy the diode. Wouldn't hurt to have a couple of spares on hand.



By comparison, the original 1N34A germanium diode has a peak reverse voltage of 45 volts giving it a maximum power rating of 5.06 watts.

As a matter of interest, before I began the initial disassembly, I connected a

two meter handheld to the watt meter and keyed in a signal. I adjusted RV1 to indicate 1.0 watts on the meter. Then I removed the 1N34 diode and replaced it with a 1N5711. The reading was up to 3.0 watts. More efficient and less of a forward voltage drop.

Set switch SW1 to position 2 and connect a digital multimeter to J2. Set the DMM to DC volts. Connect the transmitter (remember - QRP levels only!). Key the transmitter and take a voltage reading. The capacitors (C1, C2, and C3) will charge up to the positive peak of the RF voltage applied to resistor R1, less the voltage drop of the diode D1 (typically 100mV or 0.1 volts for the 1N5711 and with the slight load of a high impedance digital meter).

$$\text{Volts}^{\text{peak}} = \text{volts}^{\text{measured}} + 0.1^{\text{diode voltage drop}}$$

$$\text{Power}^{\text{watts}} = (\text{volts}^{\text{peak}} \times \text{volts}^{\text{peak}}) / 2R \text{ where } R = 50 \text{ ohms}$$

So, if you measure 22.26 vdc on your digital meter then add 0.1 vdc to it for a total of 22.36 vdc for the peak voltage.

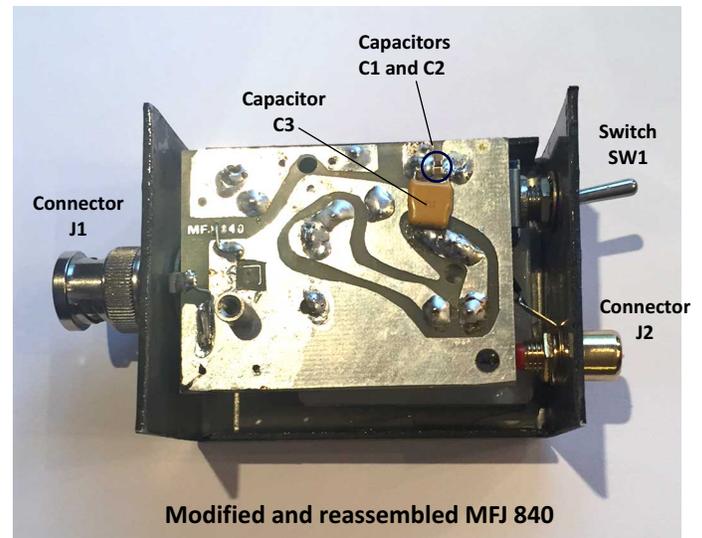
$$\text{Power}^{\text{watts}} = (\text{volts}^{\text{peak}} \times \text{volts}^{\text{peak}}) / 2R$$

$$\text{Power}^{\text{watts}} = (22.36 \times 22.36) / 2 \times 50$$

$$\text{Power}^{\text{watts}} = (499.96) / 100$$

$$\text{Power}^{\text{watts}} = 4.999$$

Before you change to switch position 1, set the adjustable resistor RV1 to maximum resistance (fully



counter-clockwise), to avoid damage to the delicate 100 uA meter movement. Then, once again key the QRP HF transmitter. Adjust RV1 to coincide with the power reading calculated above.

If instead, you want full scale to be 10 watts, adjust RV1 to place the meter pointer at the 5 watt mark, so everything will be doubled. Should your calculation comes out to some other value, say at 9 watts, set the meter to 4.5 watts.

Some QRP transmitters have provision to turn the power level up or down. If you have one of these, it would allow you to roughly calibrate several points on the scale.

For the price you pay for the MFJ 870, you shouldn't expect the quality and accuracy of a *Rhode and Schwarz*. The indicator needle on mine was low by 2-3 needle widths and there is no adjustment to zero it. At best, using the meter in position 1 to measure output power will only be approximate.



Completed watt meter ready to use.

#### Parts list

- C1 - capacitor, chip, 100v, 0.01uF
- C2 - capacitor, chip, 100v, 0.1uF
- C3 - capacitor, 100v, 1.0uF
- C4 - capacitor, 0.01uF, part of MFJ840
- D1 - diode, schottky, 1N5711
- J1 - connector, BNC, part of MFJ840
- J2 - connector, female, RCA
- M1 - meter, 100uA, part of MFJ840
- R1 - resistor, 50 ohms, 30 watt, Caddock,
- R2 - resistor, 10K, part of MFJ840
- RV1 - resistor, adjustable, 500K, part of MFJ840

Next month, I will do some measurements on both HF and VHF.

#### KICAD SOFTWARE FOR SCHEMATICS AND PC BOARD LAYOUT

In my seemingly never-ending search for schematic drawing software I sent an e-mail to the *QRP-L reflector* to see what others were now using. This query brought back a couple of responses, one of which mentioned

*KICAD*, a free, full-featured, open source software.



I spent several hours one evening playing with the schematic portion, learning how to use it. An on-line manual is available but it was fairly intuitive once I'd gotten over the initial strangeness, and after an hour or so, I was happily

modifying existing components and creating new ones. As with every other program I've looked at, the included component libraries are heavy on the digital side and skimpy on the analog. Thankfully, it has an editor function allowing you to create your own component symbols.

#### SNIPPING TOOL SOFTWARE

If you are doing something (like this newsletter) that requires insertion of a full screen shot or perhaps just a little section, snipping tool software can be invaluable. There are commercial programs out there (such as *SNAGIT*), or you can use the simple one built into your Windows operating system.

Go to *Start* in the lower left corner of your screen or hit the Windows key (the one between "fn" and "alt") and bring up the search function. Into the box named *Search programs and files* type *snipping tool*. If you have the snipping tool applet on your computer you will see it in the list of found items. Select it to open the program.

After you have it open on your screen, click on *new* and then use your mouse to choose what area you want to capture. Once selected, click on *File* and *Save as* to save your selection for future use.

If you find you use it often, drag it down and pin it to the Taskbar where it will be easier to open.

#### QRP 1-WATTER TRANSCEIVERS - PART 2

The shipment from *KitsandParts.com* of two 1Watter single band HF transceiver kits arrived, just one day short of two weeks after placing the order, with a little help from both the United States and Canadian postal systems.

The kits were packed in plastic bags, inside of paper bags, inside a 4" x 4" x 4" cardboard box. No build instructions are included. You have to print it from the web site (<http://www.kitsandparts.com/1watter-V3.php>).

Once you have that in hand, print off the service manual (<http://www.kitsandparts.com/1watter-service-manual.php>). Make sure you also check the *addendum section* to see if there are any changes or modifications you need to be aware of.

And, for up to the minute information, join the *QRPp reflector*. Post a problem or a question and someone is there with a solution.

The build instructions have you installing most of

**A better way, in my opinion, is to build section by section and test each one as you go.**



the parts before you begin to test anything. This method is fine as long as you don't make a mistake and stick a part in the wrong place or put the wrong part in the right place. Most of the problems posted to the reflector seem to be of that nature.

A better way, in my opinion, is to build section by section and test each one as you go. Chuck Adams, K7QO, has a ten-part series of videos on YouTube doing just that. Start with the first section at <https://www.youtube.com/watch?v=W0CH9Rhcm0A> and work your way through to completion. Each video begins with a list of the parts you will be installing for that phase, and finishes with how you will test each section completed, with nothing more technical than a digital multi-meter and your ears.

Combine the videos with the build instructions to get the most out of the whole experience. The latter covers the toroid and transformer winding, and expands on the test procedures given in the videos.

However you assemble it, do not remove any parts from the parts bags until you are instructed to do so. If you mix things up, you might have problems identifying them later.

These transceivers have a lot of chip capacitors (as small or smaller than the  block at the end of this section) which are used at various bypass points. If you have trouble installing something that tiny, there are capacitors of the same value with leads, included in the same plastic bag.

Building these should keep me off the streets and out of the saloons for a while. 

## QUOTE OF THE MONTH

**"It's true hard work never killed anybody, but I figure, why take the chance?."**

*Ronald Reagan*

## DI-DAH-DI-DAH

**I** f you were observant, you will have caught the misspelling of the words **April** and **Volume** on the first page. If you find anything else in error in this month's newsletter, it is not an intentional thing. It's just the proof reading department not proof reading properly.

Every time I pick up the April issue of a technical or amateur radio magazine, I'm suspicious of every article contained therein. Usually, they make them sound very believable, and it's only by careful perusal that you discover you've been "had".

I remember one in an electronics trade magazine a good number of years ago describing how the author powered his electric wheelchair with energy from an alternate universe using electronic circuitry he had devised. The way he wrote it sounded totally plausible.

Anyway, that's it for this month. Hope you enjoy this newsletter. And that's no April Fools joke.

Until next month,  
**VE1VQ**